Trend Study 29-2-03

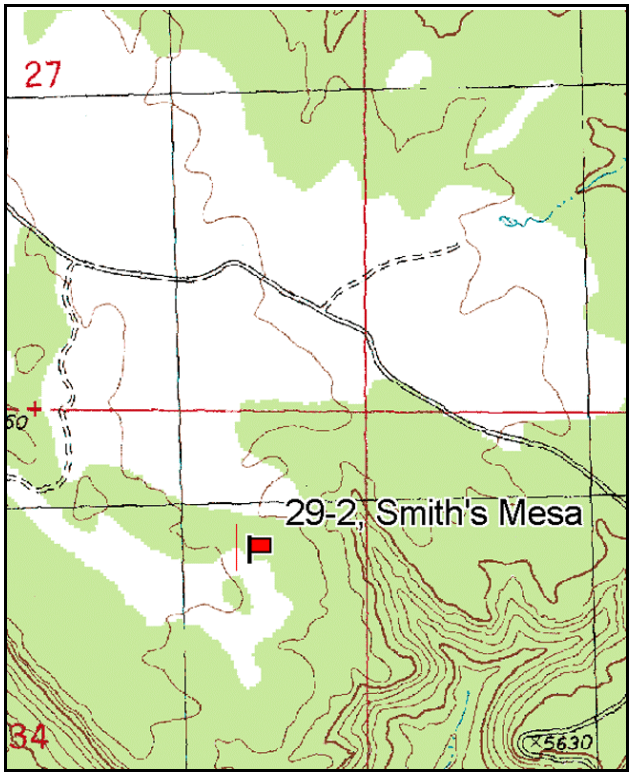
Study site name: Smith's Mesa . Vegetation type: Big Sagebrush-Grass .

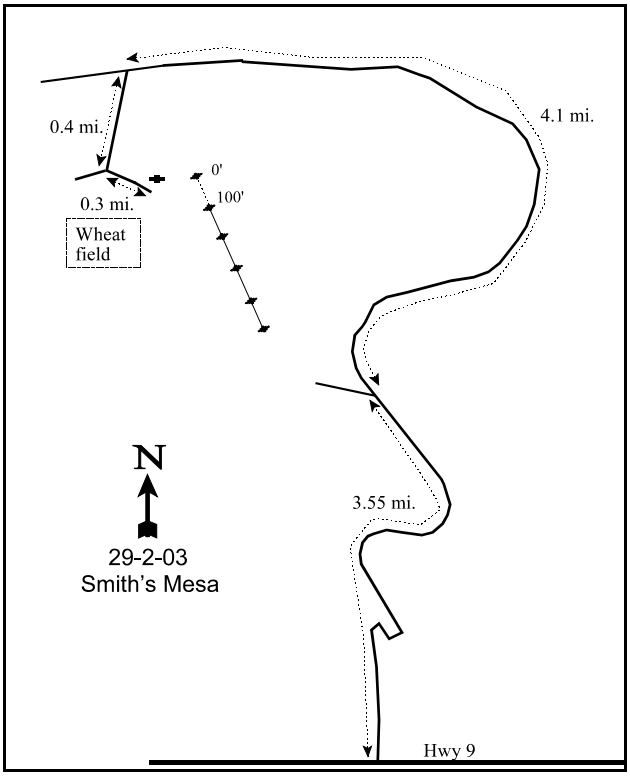
Compass bearing: frequency baseline 145 degrees magnetic.

Frequency belt placement: line 1 (11 ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

At mile marker 17 on Hwy 9, turn north onto Mesa Road. Drive up the old paved road up to the mesa top for 3.35 miles to a fork. Turn right and continue 4.1 miles to a small dirt road next to a wheat field on the left side of the main road. Turn left and follow this road 0.4 miles to a fork next to another wheat field. Turn left and follow the edge of the field 0.3 miles and stop. Walk east over a small P-J covered hill to a sage opening. The 0-foot stake is on the north end of the opening near some *Quercus turbinella*. The baseline runs at 145 degrees magnetic and is marked by half-high green fenceposts.





Map Name: Smith Mesa

Diagrammatic Sketch

Township 40S , Range 12W , Section 34

GPS: NAD 27, UTM 12S 4126851 N, 306165 E

DISCUSSION

Smith's Mesa - Trend Study No. 29-2

This trend study was established in 1998 in a Wyoming big sagebrush clearing on Smith's Mesa. The study site is surrounded on 3 sides by pinyon and juniper trees, and dryland wheat fields on the west. Slope is gentle (2-3%) with a southwest aspect and an elevation of about 5,700 feet. The large mesa is found about 3 miles north of the town of Virgin. It rises approximately 2,000 feet above the town and supports many sagebrush openings surrounded by pinyon and juniper woodland. Some dryland wheat fields are also found on the south end of the mesa on a large area of private land. Smith's Mesa provides important winter range for deer which summer in Zion National Park. Pellet group data from the site estimated 38 deer days use/acre in 1998 (94 ddu/ha). Some cattle sign was also encountered with an estimated 7 cow days use/acre (17 cdu/ha). Pellet group data from 2003 indicated much lighter use at 16 deer days use/acre (40 ddu/ha). No cattle sign was noted in 2003. A cattle pond is found about 1/3 of a mile east of the site but it appears to contain water only in the early spring.

Soil on the site is very sandy and deep with the effective rooting depth estimated at 23 inches. Soil texture is a sandy loam which is slightly acidic (pH 6.2). Phosphorus is low at 8.1 ppm, when 10 ppm is considered a minimum value for normal plant growth and development. Rock is absent on the surface and in the profile. Due to the sandy nature of the soil and poor water holding capacity, average soil temperature is high averaging over 70°F at a depth of between 12 and 21 inches in 1998 and 2003. Under most conditions, this would cause rapid drying of the soil profile during the summer. Herbaceous plants, mostly in the form of winter annuals, are common and provide adequate soil protection. In addition, cryptogamic crusts are abundant. Cover of bare ground is still high at 33% in 1998 and 42% in 2003. There appears to be some pedestalling of soil around shrubs, possibly caused as much by wind as by water. Erosion is not a problem due to the gentle terrain and the erosion condition class was determined to be stable in 2003.

The site supports a fair stand of big sagebrush with a few antelope bitterbrush. Some sagebrush plants exhibit characteristics of basin big sagebrush (*Artemisia tridentata tridentata*). There also appears to be some hybridization with mountain big sagebrush (*Artemisia tridentata vaseyana*) since a few sagebrush sampled fluoresced under a black light. Since most of the sagebrush appeared to be more like basin big sagebrush, all sagebrush on the site was lumped into that subspecies. Sagebrush density was estimated at 2,200 plants/acre in 1998 declining to 1,500 by 2003. The stand is mostly mature, light to moderately utilized, in good vigor, and shows low to moderate percent decadence. Young recruitment was good in 1998 with 10% of the population consisting of young plants. No seedlings or young were encountered in 2003. Only a few bitterbrush plants occur on the site. These plants generally show moderate to heavy use and annual leader growth was fair in 2003 averaging 3 inches.

The invasive shrub, broom snakeweed, is the most abundant shrub on the site with a population estimated at 5,380 plants/acre in 1998. Drought conditions in 2003 caused a 61% decline in density to 2,100 plants/acre. Most of the population is mature. Pinyon and juniper trees appear to be slowly encroaching into the clearing, but numbers are still low. Point-quarter data from 1998 estimated 6 juniper and 6 pinyon trees/acre. Average basal diameter was 10.4 inches for pinyon and 5.7 inches for juniper.

The herbaceous understory is very poor with two annual grasses, cheatgrass and six weeks fescue, providing 100% of the grass cover in 1998 and 88% in 2003. Another annual, rattail fescue was encountered in 2003 and was probably lumped with sixweeks fescue in 1998. Perennial grasses are represented by Sandberg bluegrass, bottlebrush squirreltail, and sand dropseed, but these species occur very rarely. The forb component is composed almost entirely of annuals. Total forb cover was estimated at nearly 3% in 1998 and nearly 4% in 2003. The most abundant species is storksbill, which accounted for 72% and 71% of the total forb cover in 1998 and 2003 respectively.

1998 APPARENT TREND ASSESSMENT

Trend for soil appears stable, primarily due to the level terrain and rapid infiltration capacity of the soil. Browse also appears stable with a relatively healthy population of basin big sagebrush. Use is light to moderate, vigor normal, and percent decadence moderately low at 13%. Reproduction is adequate to maintain the population if conditions do not change significantly. The herbaceous understory is poor. Composition of grasses and forbs is totally dominated by annuals. Perennial species are present yet rare.

2003 TREND ASSESSMENT

Trend for soil is down slightly. Percent cover of bare ground increased from 33% in 1998 to 42% in 2003. In addition, vegetation and litter cover declined. Most of the decrease in vegetation and litter cover is due to a 37% reduction in cover of annual grasses. Even with the abundant exposed bare ground, erosion is not a problem due to the sandy soil and the gentle terrain. Trend for sagebrush is slightly down. Density declined 32% from 2,200 to 1,500 plants/acre. Utilization was mostly light but vigor was poor on 15% of the plants sampled and percent decadence increased from 13% to 33%. No seedlings or young plants were encountered. Drought conditions did cause a 61% decline in the density of broom snakeweed. Trend for the herbaceous understory is difficult to determine due to the lack of perennial species. Sum of nested frequency of the few perennial grasses found on the site declined slightly while sum of nested frequency of perennial forbs increased slightly. Annual grasses and forbs dominate the understory. Sum of nested frequency of annual grasses and forbs increased slightly but cover dropped from 33% in 1998 to 23% in 2003. Trend is considered stable and in very poor condition.

TREND ASSESSMENT
soil - slightly down (2)
browse - slightly down (2)
herbaceous understory - stable but poor (3)

HERBACEOUS TRENDS --
Management unit 29 , Study no: 2

Type	Species	Nested Frequency		Average Cover %	
		'98	'03	'98	'03
G	Bromus tectorum (a)	436	333	22.90	8.58
G	Festuca myuros (a)	-	105	-	2.18
G	Poa secunda	15	4	.05	.03
G	Sitanion hystrix	-	-	.00	-
G	Sporobolus cryptandrus	2	-	.03	-
G	Vulpia octoflora (a)	304	348	7.54	8.48
Total for Annual Grasses		740	786	30.45	19.25
Total for Perennial Grasses		17	4	0.08	0.03
Total for Grasses		757	790	30.53	19.29

Type	Species	Nested Frequency		Average Cover %	
		'98	'03	'98	'03
F	Draba spp. (a)	25	-	.05	-
F	Erodium cicutarium (a)	78	55	1.95	2.74
F	Eriogonum racemosum	-	3	-	.00
F	Eriogonum umbellatum	4	3	.03	.06
F	Gilia spp. (a)	-	20	-	.17
F	Lappula occidentalis (a)	32	15	.11	.11
F	Lygodesmia grandiflora	-	3	-	.03
F	Microsteris gracilis (a)	17	-	.06	-
F	Navarretia intertexta (a)	5	39	.03	.30
F	Oenothera pallida	4	8	.01	.04
F	Orobanche fasciculata	1	-	.00	-
F	Plantago patagonica (a)	11	26	.39	.08
F	Polygonum douglasii (a)	3	-	.00	-
F	Senecio multilobatus	17	39	.05	.32
F	Unknown forb-perennial	2	-	.00	-
Total for Annual Forbs		171	155	2.60	3.41
Total for Perennial Forbs		28	56	0.11	0.47
Total for Forbs		199	211	2.71	3.88

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 29 , Study no: 2

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata tridentata	54	44	11.80	9.38
B	Chrysothamnus viscidiflorus viscidiflorus	0	1	-	-
B	Gutierrezia sarothrae	51	28	3.29	1.75
B	Juniperus osteosperma	0	1	.78	1.48
B	Opuntia spp.	3	2	.18	.18
B	Pinus monophylla	1	2	1.70	1.29
B	Purshia tridentata	1	0	.00	-
B	Salvia dorrii	1	2	-	.15
Total for Browse		111	80	17.76	14.23

CANOPY COVER, LINE INTERCEPT --
Management unit 29 , Study no: 2

Species	Percent Cover	
	'98	'03
Artemisia tridentata tridentata	-	10.66
Gutierrezia sarothrae	-	.96
Juniperus osteosperma	-	3.20
Opuntia spp.	-	.03
Pinus monophylla	1.39	2.03
Salvia dorrii	-	.53

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 29 , Study no: 2

Species	Average leader growth (in)
	'03
Artemisia tridentata tridentata	1.5
Purshia tridentata	3.1

POINT-QUARTER TREE DATA --
Management unit 29 , Study no: 2

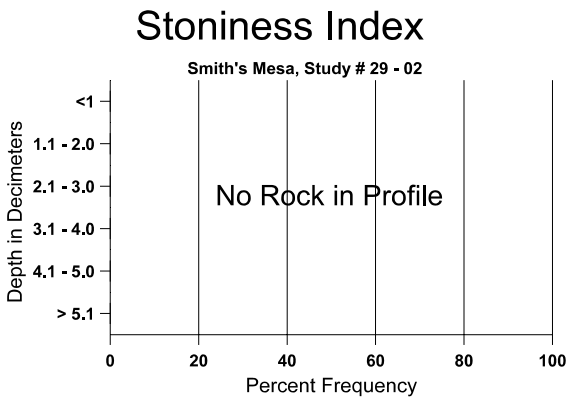
Species	Trees per Acre		Average diameter (in)	
	'98	'03	'98	'03
Juniperus osteosperma	6	N/A	5.7	N/A
Pinus monophylla	6	N/A	10.4	N/A

BASIC COVER --
Management unit 29 , Study no: 2

Cover Type	Average Cover %	
	'98	'03
Vegetation	46.12	38.27
Rock	.03	.00
Pavement	.04	.05
Litter	39.47	24.39
Cryptogams	12.36	10.87
Bare Ground	33.09	41.97

SOIL ANALYSIS DATA --
Management unit 29, Study no: 2, Study Name: Smith''s Mesa

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
23.2	71.3 (11.7)	6.2	72.7	17.4	9.8	0.7	8.1	3.2	0.2



PELLET GROUP DATA --
Management unit 29 , Study no: 2

Type	Quadrat Frequency '98	Quadrat Frequency '03	Days use per acre (ha) '98	Days use per acre (ha) '03
Rabbit	23	25	-	-
Deer	44	2	38 (94)	16 (40)
Elk	-	-	-	1 (2)
Cattle	1	-	7 (17)	-

BROWSE CHARACTERISTICS --
Management unit 29 , Study no: 2

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata tridentata											
98	**2200**	20	220	1700	280	340	28	4	13	5	28/39
03	**1500**	-	-	1000	500	520	5	0	33	15	30/40
Ceanothus greggii											
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	0	76/121
Chrysothamnus viscidiflorus viscidiflorus											
98	**0**	-	-	-	-	-	0	0	-	0	7/13

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
03	**180**	-	-	180	-	-	0	0	-	0	-/-
Gutierrezia sarothrae											
98	**5380**	20	440	4840	100	220	0	0	2	.37	9/11
03	**2100**	200	120	1800	180	300	0	0	9	7	9/13
Juniperus osteosperma											
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**20**	-	-	20	-	-	0	0	-	0	-/-
Opuntia spp.											
98	**60**	-	-	60	-	-	0	0	-	0	6/16
03	**40**	-	-	40	-	-	0	0	-	0	7/15
Pinus monophylla											
98	**20**	-	-	20	-	-	0	0	-	0	-/-
03	**40**	20	20	20	-	-	0	0	-	0	-/-
Purshia tridentata											
98	**20**	-	20	-	-	-	0	0	-	0	23/99
03	**0**	-	-	-	-	-	0	0	-	0	17/46
Quercus turbinella											
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	0	129/216
Salvia dorrii											
98	**20**	-	-	20	-	-	0	0	-	0	13/46
03	**40**	-	20	20	-	-	0	0	-	0	15/36